Claims

1.

A method for increasing oil recovery from an oil reservoir in which method gas is injected into the reservoir, comprising the steps of:

- separation of air into an oxygen-rich fraction and a nitrogen-rich fraction,
- providing a natural gas stream and leading the natural gas stream and at least a part of the oxygen-rich fraction to a reformer for conversion to synthesis gas mainly comprising H_2, CO, CO_2 and lower amounts of non-converted methane, water vapour and nitrogen,
- formation of higher hydrocarbons from the synthesis gas in a synthesis unit,
- withdrawing raw synthesis products and a waste gas from the synthesis unit, and
- injecting the nitrogen-rich fraction and at least a part of the waste gas into the oil reservoir to increase the oil recovery from the reservoir,

2.

Method according to claim 1, wherein steam or water generated during the syngas production and/or synthesis is injected into the reservoir.

3.

A plant for providing gas for downhole injection for pressure support in an oil reservoir for recovering of hydrocarbons and production of oxygenated hydrocarbons or higher hydrocarbons from natural gas, comprising:

- an air separation unit (2) for production of an oxygen-rich fraction for supply to processes that require oxygen, and a nitrogen-rich fraction for injection;
- a reformer (8) for conversion of a mixture of natural gas, water and oxygen or oxygen enriched air from the air separation unit into a synthesis gas comprising mainly H_2, CO, CO_2 and small amounts of methane in addition to any inert gas, such as nitrogen;
- a synthesis unit (15, 56) for conversion of the synthesis gas for synthesis of higher hydrocarbons;
- means for injecting gas (6) into the reservoir;
- means for transferring nitrogen from the air separation unit to the means for injecting gas; and

- means for transferring at least a part of a waste gas from the synthesis unit to the means for injecting gas.

4.

A plant according to Claim 3, additionally comprising a tail gas treatment unit (63) for removing CO by a shift reaction and separation of hydrogen from the remaining tail gas.

5.

Plant according to claim 4, comprising means (65) for transferring the remaining tail gas from the tail gas treatment unit (63) to the means for injecting gas (6).

6.

Plant according to any of the claims 3 to 5 wherein the synthesis unit (15, 56) comprises one or more once-through Fischer-Tropsch units for synthesis of higher hydrocarbons.

7.

Plant according to claim 6, comprising means for introducing all or parts of the separated hydrogen from the tail gas treatment unit (63) into the Fischer Tropsch loop to adjust the H_2/CO ratio to a desired level.

8.

A method for increasing oil recovery from an oil reservoir in which method gas is injected into the reservoir, comprising the steps of:

- supplying of compressed air,
- providing a natural gas stream and leading the natural gas stream and at least a part of the air stream to a reformer for conversion to synthesis gas mainly comprising N_2 ,H_2, CO, CO_2 and lower amounts of non-converted methane, and water vapour,
- formation of higher hydrocarbons from the synthesis gas in a synthesis unit,
- withdrawing raw synthesis products and a nitrogen rich waste gas from the synthesis unit, and
- injecting at least a part of the nitrogen-rich waste gas into the oil reservoir to increase the oil recovery from the reservoir,

9.

Method according to claim 8, wherein steam or water generated during the syngas production and/or synthesis is injected into the reservoir.

10.

A plant for providing gas for downhole injection for pressure support in an oil reservoir for recovering of hydrocarbons and production of oxygenated hydrocarbons or higher hydrocarbons from natural gas, comprising:

- an air compression unit (24) for production of compressed air for supply to processes that require air;
- a reformer (8) for conversion of a mixture of natural gas, water and air from the air compression unit into a synthesis gas comprising mainly N_2, H_2, CO, CO_2 and small amounts of methane;
- a synthesis unit (15, 56) for conversion of the synthesis gas for synthesis of higher hydrocarbons;
- means for injecting gas (6) into the reservoir;
- and
- means for transferring at least a part of the nitrogen rich waste gas from the synthesis unit to the means for injecting gas.

11.

A plant according to Claim 10, additionally comprising a tail gas treatment unit (63) for removing CO by a shift reaction and separation of hydrogen from the remaining tail gas.

12.

Plant according to claim 4, comprising means (65) for transferring the remaining tail gas from the tail gas treatment unit (63) to the means for injecting gas (6).

13.

Plant according to any of the claims 10 to 12 wherein the synthesis unit (15, 56) comprises one or more once-through Fischer-Tropsch units for synthesis of higher hydrocarbons.

14.

Plant according to claim 13, comprising means for introducing all or parts of the separated hydrogen from the tail gas treatment unit (63) into the Fischer Tropsch loop to adjust the H_2/CO ratio to a desired level.